REMARKS

Claims 1-41 are pending in the case. In the Office Action mailed August 24, 2005, the Examiner took the following action: (1) rejected claims 8 as improperly dependent on claim 9; (2) rejected claims 1-3, 6, 7-10, 13-17, 20-24, 27-31, 34-48 and 41 under 35 USC § 102(e) as being anticipated by Kacyra et al. (U.S. 6,619,406); (3) rejected claims 4, 5, 11, 12, 18, 19, 25, 26, 32, 33, 39 and 40 under 35 USC § 103(a) as being unpatentable over Kacyra et al. (U.S. 6,619,406) in view of Foley et al. and Valle et al. Applicant respectfully requests reconsideration and withdrawal of the rejections in view of the foregoing amendments and the following remarks.

I. Rejection of claim 8 as improperly dependent on claim 9.

The Examiner objected to claim 8 as being improperly dependent on claim 9. Claim 8 claims a reverse orientation visualization model that exposes areas of ground occlusion. However, claim 9 does not claim a reverse orientation visualization model. Applicant has amended claim 8 to depend from independent claim 1. Applicant submits that this amendment remedies the improper dependency noted by the Examiner, and respectfully requests reconsideration and withdrawal of the objection.

II. Rejection of claims 1-3, 6, 7-10, 13-17, 20-24, 27-31, 34-48 and 41 under 35 USC § 102(e) as being anticipated by Kacyra et al. (U.S. 6,619,406).

The Examiner rejected claims 1-3, 6, 7-10, 13-17, 20-24, 27-31, 34-38 and 41 under 35 USC § 102(e) as being anticipated by Kacyra et al. Claim 8 has been amended to depend from independent claim 1.

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Kacyra et al. (U.S. 6,619,406)

Kacyra teaches methods for operating a laser scanning system. The laser scanning system is used in construction projects to generate field surveys. The field surveys are used by an architect or engineer to create construction drawings.

More specifically, Kacyra teaches generating volume and surface data of objects using collected points for that object. (1:32-34). This is distinct from Applicant's teaching of generating an isosurface. The term isosurface is known in the relevant art according to the following definitions: "A type of display that shows a 3D surface for a given value." my.unidata.ucar.edu/content/software/idv/docs/workshop/glossary.html; "Surface where some value is constant." www.eng.dmu.ac.uk/~hgs/panorama/glossary.html; "An isosurface is a three-dimensional analog of an isopleths. It represents a surface of constant value (e.g. pressure, temperature, velocity, density) within a volume of space." En.wikipedia.org/wiki/isosurface. Applicant respectfully submits that generating an isosurface as taught by Applicant is not equivalent to generating a surface of an object as taught by Kacyra.

More specifically, Kacyra does not disclose, teach, or fairly suggest a method for facilitating detection of an object in a point cloud of three dimensional imaging data, where the object potentially is obscured by intervening obstacles that comprises *generating at least one isosurface associating elements having substantially common attributes.*

Instead, Kacyra teaches the processing of a point cloud obtained from a laser scan field survey into wire meshes, 3-D models and 2-D drawings for export to popular computer-aided design (CAD) rendering or other software as construction drawings, (1:47-64). The defined points in a construction drawing for a structure, as taught by Kacyra, are positionally related to scan points in the corresponding laser scan field survey, (2:2-5). For example, the scan points of a point cloud in Kacyra can be directly compared to stored design plans to determine deviations from the design plans, (5:29-31). Thus, the creation of structural drawings (or object surfaces)

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based on scanned points in Kacyra does not require spatial analysis and geometric transformation of an original point cloud to generate at least one isosurface.

In comparison, the present invention teaches the generation of at least one isosurface by advanced spatial analysis and geometric transformation of the original point cloud, such as by the marching cubes method. Moreover, isosurfaces generated by the present invention only presents a visual depiction of the *implied geometries* of identified features. In contrast, it is apparent that Kacyra teaches that scan points are used to depict exact representations of actual surfaces and geometries for the generation of scalar drawings or models. This is because Kacyra teaches that such drawings are used for constructing structures and mating components, (2:1-5 and 5:29-35).

Second, Kacyra fails to teach or fairly suggest a method for facilitating detection of an object in a point cloud of three dimensional imaging data, where the object potentially is obscured by intervening obstacles, that comprises *generating a reverse orientation visualization model for a region of interest.*

Kacyra merely teaches identifying objects within a site by comparing the scan points to predefined geometric shapes, (3:2-6). This is distinguishable from generating a reverse orientation visualization model. The generation of a reverse orientation visualization model for a region of interest requires one or more advanced analytical methods, such as the FBM and the marching cubes method.

Thus, the generation of a reverse orientation visualization model for a region of interest must necessarily involves deriving isosurfaces and implied geometries from a point cloud. In contrast, because Kacyra only teaches identifying particular objects within a site by directly comparing scan points of the point cloud to predefined geometric shapes, Kacyra does not teach deriving isosurfaces and implied geometries from a point cloud.

Therefore, Kacyra does not anticipate claim 1, and claims 2-8 depending therefrom. Kacyra also does not anticipate claims 15 and 29 for the same reason claim 1 is not anticipated

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because each of claims 15 and 29 also teaches the generation of at least one isosurface associating elements having substantially similar attributes, and the generation of a reverse orientation visualization model. Further, Kacyra does not anticipate claims 16-22 because they depend from claim 15. Kacyra does not anticipate claims 30-36 because they depend from claim 29.

Similarly, Kacyra does not anticipate claim 9 because it also teaches the generation of at least one isosurface associating elements having substantially common attributes. Additionally, Kacyra does not anticipate claim 23 and 37 for the same reason claim 9 is not anticipated. Further, Kacyra does not anticipate claims 10-14 because they depend from claim 9. Kacyra does not anticipate claims 24-28 because they depend from claim 23. Lastly, Kacyra does not anticipate claims 38-41 because they depend from claim 37.

For the foregoing reasons, Applicant respectfully requests reconsideration and withdrawal of the rejections of claims 1-3, 6, 7-10, 13-17, 20-24, 27-31, 34-48 and 41 under 35 USC § 102(e) as being anticipated by Kacyra (6,619,406).

III. Rejection of claims 4, 5, 11, 12, 18, 19, 25, 26, 32, 33, 39 and 40 under 35 USC § 103(a)

The Examiner rejected claims 4, 5, 11, 12, 18, 19, 25, 26, 32, 33, 39 and 40 under 35 U.S.C. 103(a) as being unpatentable over Kacrya et al. in view of Foley et al, in further view of Valle et al.

Foley et al.

Foley teaches generating an isosurface using a marching cubes method. Foley teaches that the method involves evaluating a field at a sequence of grid points along one axis extending from each source, and finding a cube with an edge intersected by the isosurface. By working outward from these seed cubes, the entire level surface can be located.

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Valle et al.

Valle teaches generating a mesh using a binning method. Valle teaches using a binner macro to take a scattered set of points as its input and fitting them to a uniform mesh, where each node of the uniform mesh is referred to as a bin. The macro then counts the number of points in each bin. If node data is available for the input points the macro is able to count the number of points that lies within certain data bins. The macro allows a set of scattered points to be summarized.

Applicant respectfully requests reconsideration and withdrawal of the rejections based on 35 U.S.C. 103(a) as being unpatentable over Kacrya et al. in view of Foley et al, in further view of Valle et al.. Applicant's specification points out that there is currently a computational problem in dealing with large numbers of actual data points. Applicant's inventive methods resolve this problem by aggregating data points and creating isosurfaces. Effectively, one loses information and detail. The isosurface generates an implied geometry and not an explicit geometry that would result from keeping all the data points. Applicant respectfully submits that the above-cited references teach away from Applicant's inventive methods in that they are directed to determining an explicit representation of an object geometry.

Applicant respectfully submits that the problem of finding partially hidden objects (where one would anticipate that having as much detail as possible to perform the task is preferable) by Applicant's inventive approach of "throwing out" detail to generate isosurfaces rather than explicit surfaces would be the wrong way to approach the problem. Applicant respectfully submits that the inventive approach is counterintuitive and non-obvious.

The isosurface model allows a continuous spectrum of level of detail to be presented, dynamically selectable by the viewer. The (a) appropriate reduction of detail combined with the (b) extension to continuous light reflective surfaces is what allows the viewer intuitively to adjust and distinguish between total occlusion footprint from a vehicle and partial occlusion footprint

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from a bush, an otherwise undetectable distinction. An explicit model cannot be "tuned" to the a priori unknown level of detail needed for this intuitive discrimination.

Thus, using Applicant's inventive methods, by "throwing out" details to reduce the computational load, the unexpected result of achieving improved search results is achieved. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections based on 35 U.S.C. 103(a) as being unpatentable over Kacrya et al. in view of Foley et al, in further view of Valle et al..

Furthermore, Applicant respectfully submits that the additionally-cited references (Foley *et al.*, and Valle *et al.*) do not remedy the above-noted absent teachings of the previously-described reference (Kacyra), and do not disclose, teach, or fairly suggest the ground vehicle detection method taught by the Applicant. Specifically, there is no teaching or suggestion in the additionally cited Foley *et al.* (Foley) of a method for facilitating detection of an object in a point cloud of three dimensional imaging data, where the object potentially is obscured by intervening obstacles that comprises *generating at least one isosurface associating elements having substantially common attributes.*

Foley merely teaches the mathematical steps for generating an isosurface using the marching cubes method. As a result, Foley, even when combined with Kacyra's teaching of using scan points of a laser field survey to generate exact representations of actual surfaces and geometries for the generation of scalar drawings or models used in building construction, cannot teach or fairly suggest the generation of *isosurfaces* associating elements having substantial common attributes to detect obscured objects. Isosurfaces of the present invention, unlike representation of actual surfaces and geometries, may be visual representation of implied geometries of identified features.

Likewise, there is no teaching or suggestion in the additionally cited Foley and Valle of a method for facilitating detection of an object in a point cloud of three dimensional imaging data,

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where the object is potentially obscured by intervening obstacles that comprises *generating a reverse orientation visualization model for a region of interest.*

Foley merely teaches the mathematical steps for generating an isosurface using the marching cubes method. Valle merely teaches the mathematical steps involved in a population function computed on a sample mesh by a Fast Binning Method (FBM). Foley and Valle does not teach any use of isosurfaces or FBM for generating reverse orientation visualization models. As a result, Foley and Valle, even when combined with Kacyra's teachings of identifying objects within a site by directly comparing scan points to predefined geometric shapes, cannot teach or fairly suggest the use of one or more advanced analytical methods, such as marching cubes and FBM, for the purpose of generating reverse orientation visualization model for a region of interest.

Therefore, these additionally cited references, either singly or in combination with the previously-described references, do not anticipate or render obvious claims 1, and claims 4 and 5 depending therefrom, because claim 1 teaches the generation of at least one isosurface associating elements having substantially similar attributes, and the generation of a reverse orientation visualization model. For the same reason, these additionally cited references, either singly or in combination with the previously described references, do not anticipate or render obvious claim 15 and claims 18 and 19 depending therefrom, and claim 29 and claims 32 and 33 depending therefrom.

Similarly, these additionally cited references, either singly or in combination with the previously-described references, do not anticipate or render obvious claims 9, and claims 11 and 12 depending therefrom, because claim 9 teaches the generation of at least one isosurface associating elements having substantially similar attributes. For the same reason, these additionally cited references, either singly or in combination with the previously described references, do not anticipate or render obvious claim 23 and 25 and 26 depending therefrom, claim 37 and claims 39 and 40 depending therefrom.

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For the foregoing reasons, Applicant respectfully requests reconsideration and withdrawal of the rejections of claims 4, 5, 11, 12, 18, 19, 25, 26, 32, 33, 39 and 40 under 35 USC § 103(a).

CONCLUSION

For the foregoing reasons, applicant respectfully requests reconsideration and withdrawal of the rejections of claims 1-41. If there are any remaining matters that may be handled by telephone conference, the Examiner is kindly invited to call the undersigned at his convenience.

Respectfully submitted,

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MAIL CERTIFICATE

I hereby certify that this communication is being deposited with the United States Postal Service via first class mail under 37 C.F.R. § 1.08 on the date indicated below addressed to: MAIL STOP AMENDMENTS, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

November 23, 2005 — Date of Deposit

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